Properties and Changes in Matter

2-4 The student will demonstrate an understanding of the properties of matter and the changes that matter undergoes. (Physical Science)

2.4.1 Recall the properties of solids and liquids.
Taxonomy level: 1.2-A Remember Factual Knowledge

Previous/Future knowledge: In kindergarten (K-5.1), students classified objects by observable properties. This is the first time that students have investigated the three states of matter. This is foundational knowledge that will be further developed in 3rd grade (3-4.1) when students classify different forms of matter (including solids, liquids, and gases) according to their observable and measurable properties. In the 5th grade (5-4.2), students will compare the physical properties of the states of matter (including volume, shape, and the movement and spacing of particles).

It is essential for students to know the properties of solids and liquids.

Liquid
- A liquid is a form of matter that does not have its own shape.
- A liquid takes the shape of the container it is in.
- A liquid can flow, be poured, or spilled.
- A liquid can change to a solid by freezing, for example, water to ice cubes.

Solids
- A solid is the only form of matter that has its own shape.
- Some examples of solids are a chair, a rock, or a table.
- Some properties of solids are color, shape, size, weight, texture, sinks, floats, hardness, and magnetism.

It is not essential for students to know about gases at this grade level. They will be introduced to that concept at third grade in indicator 3-4.1.

Assessment Guidelines:
The objective of this indicator is to *recall* the properties of solids and liquids; therefore, the primary focus of assessment should be to remember these properties. However, appropriate assessments should also require students to *identify* objects as a solid or a liquid; or *recognize* the properties of solids and liquids

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2.4.2 Exemplify matter that changes from a solid to a liquid and from a liquid to a solid.
Taxonomy level: 2.2-B Understand Conceptual Knowledge

Previous/Future knowledge: Students have explored the concept of changes in kindergarten (seasons) and first grade (the sky), but this is the first time they have learned about changes in matter. This is foundational knowledge that will be further developed in 3rd grade (3-4.2) when students explain how water and other substances change from one state to another (including melting, freezing, condensing, boiling, and evaporating).

It is essential for students to know that matter can change from a solid to a liquid and a liquid to a solid.

Solid to a liquid
- By heating—for example solid butter, chocolate, popsicles, or ice cream will melt into a liquid when heat is added.

Liquid to a solid
- By cooling—for example melted wax will harden into the shape of its container when heat is removed.

It is not essential for students to know about gases at this grade level. They will be introduced to that concept at third grade in indicator 3-4.1.

Assessment Guidelines:
The objective of this indicator is to *exemplify* matter that changes forms; therefore, the primary focus of assessment should be to give examples matter changing from a solid to liquid and a liquid to a solid. However, appropriate assessments should also require students to *identify* examples of matter that has changed using a picture, drawing, or diagram.

Properties and Changes in Matter

2-4 The student will demonstrate an understanding of the properties of matter and the changes that matter undergoes. (Physical Science)

2.4.3 Explain how matter can be changed in ways such as heating or cooling, cutting or tearing, bending or stretching.
Taxonomy level: 2.7-B Understand Conceptual Knowledge

Previous/Future knowledge: In 2nd grade (2-2.4), students exemplified matter that changes from a solid to a liquid and from a liquid to a solid. This is foundational knowledge that will be further developed in 3rd grade (3-4.2) when students explain how water and other substances change from one state to another (including melting, freezing, condensing, boiling, and evaporating). In 7th grade (7-5.10), students will compare physical changes (including changes in size, shape, and state) to chemical changes that are the result of chemical reactions (including changes in color or temperature and formation of a precipitate or gas).

It is essential for students to know that matter can be changed in many different ways.

Heating	For example, when you heat butter, it melts
Cooling	For example, when you cool water, it freezes to ice
Cutting	For example, when you cut meat, it changes from one piece to many pieces
Tearing	For example, when you tear paper, it changes from one piece to many pieces
Bending	For example, when you bend metal, it changes shape like bending a paperclip could make it straight instead of curvy
Stretching	For example, when you stretch modeling clay, it becomes thin

It is not essential for students to explain the chemical changes that occur as things are heated or cooled.

Assessment Guidelines:
The objective of this indicator is to *explain* how matter can be changed; therefore, the primary focus of assessment should be to construct a cause-and-effect model of the various ways that matter is affected by heating or cooling, cutting or tearing, bending or stretching. However, appropriate assessments should also require students to *recall* that heating or cooling, cutting or tearing, bending or stretching matter are all ways to change matter.

Properties and Changes in Matter

2-4 The student will demonstrate an understanding of the properties of matter and the changes that matter undergoes. (Physical Science)

2.4.4 Recognize that different materials can be mixed together and then separated again.
Taxonomy level: 1.1-A Remember Factual Knowledge

Previous/Future knowledge: This is the first time that students have investigated the concepts of mixtures and separation. This is foundational knowledge that will be further developed in 5th grade (5-4.2) when students summarize the characteristics of a mixture, recognizing a solution as a kind of mixture and use the processes of filtration, sifting, magnetic attraction, evaporation, chromatography, and floatation to separate mixtures.

It is essential for students to know that materials can be mixed together and then separated again.

- For example, a salad may contain lettuce, tomatoes, and cucumbers. The ingredients can be mixed all together and then separated out again.
- Another example may be taking a handful of different coins or buttons and separating them out into the individual types of coins or buttons.

It is not essential for students to work with mixtures that cannot be separated (flour and eggs) at this grade level.

Assessment Guidelines:
The objective of this indicator is to *recognize* that materials can be mixed together and then separated; therefore, the primary focus of assessment should be to remember that some mixtures can be separated.